APPENDIX A

WORK PLAN

Studies of Winnipeg Floodway Expansion / Ste. Agathe Detention

Work Plan

Basic Assumptions

1 **General**

1.1 Study Team will be comprised of staff from KGS Group, InterGroup, and from North South Consultants.

1.2 The most advantageous means of public interaction and assessment of support or opposition to the will be addressed in this study. Implementation of the selected plan is not budgetted under this study.

1.3 All hydraulic simulations of the "Red Sea" using the established MIKE-11 model that are required for this study will be done by Manitoba Conservation, at the request of KGS Group.

1.4 Examination of required protective measures to mitigate the backwater effects from the Ste. Agathe Detention Structure, and to estimate costs of achieving that protection will be undertaken by Manitoba Conservation staff, based on input provided by KGS Group.

2 **Intent is for minimum work that would be required to advance the understanding of both Projects**

2.1 No subsurface exploration for either option (Note : Ste Agathe cannot therefore be considered to be at full feasibility level of study)

2.2 No environmental permits required at this stage, and no requirement for an EIA

2.3 Capital cost estimates for Floodway expansion will be prepared to a target accuracy of 15 to 20% and will be based on pessimistic assumptions of subsurface conditions in lieu of information from new subsurface explorations.

2.4 Capital cost estimates for Ste. Agathe Detention Scheme are those provided in KGS Report to IJC and are considered accurate to +/-25%.

2.5 Report by Mar.31, 2001 will indicate results to date (in summary form) covering all major issues.

2.6 Report by July 31, 2001 would provide results of overall study. Completion by this date, and completion of the report under Item 2.5 would be contingent upon a start date of Dec.1/2000.

Number		Work Item	Comments
1		***Ste Agathe Detention Structure***	
1.1		**Identify socio-economic issues for the project**	
	1.1.1	Understanding project	
	1.1.2	Define study area and affected groups	
	1.1.3	Socio-economic characterization	Determine under what baseline socio-economic conditions the projects will be assessed. Sources could include key person interviews, case studies, and comments received during Commission meetings with the public.
	1.1.4	Identify socio economic issues and how projects compare on these issues	Using the characteristics identified in 1.1.3 and 2.2.3, this task would develop a list of issues and means of comparing alternatives against these issues.
	1.1.5	Identify strategies to mitigate key adverse socio-economic impacts	
1.2		**Investigate precedents of this type of concept**	
	1.2.1	Flood protection works involving increased water levels	These reviews would include literature searches, as well as contact with authorities such as the USACE, USFEMA, CIDA, etc.
	1.2.2	Process of public consultation/consensus building	
1.3		**Identification of impacts of concept on communities in R.R. Valley**	
	1.3.1	Review hydraulic analyses to date	This would entail review of previous calculations with Mike-11 and discussion with Man. Conserv. About additional work required, and limitations of results to date. The issue of wind effects would be considered.
	1.3.2	Prescribe additional Mike-11 runs if necessary, liaise with Man. Conserv. on execution of Mike-11 simulations, and review results when available	
	1.3.3	Undertake backwater analyses where required on tributaries to develop estimates of impacts on communities	
	1.3.4	Develop table of increased water levels caused by the Ste Agathe Detention Structure on water level and duration of flooding at key locations in Valley, relative to "natural condition", for range of flood events (1:100 to 1:1000 year)	Tablewould include list of existing flood protection measures, and existing ring dike crest elevations.
1.4		**Invest. all identified environ. impacts of project and means to mitigate**	
	1.4.1	Review previous studies by KGS Group	Main issues have been identified and described in KGS Group Report to IJC Task Force
	1.4.2	Confirm/identify environmental impacts of project	This would include review and consideration of all aquatic, terrestrial, and air quality impacts both during construction and in the long term.
	1.4.3	Identify means to mitigate impacts	This would entail working with the engineering staff to identify and develop schemes to mitigate as much as possible the potential impacts.
	1.4.4	Liaise with government agencies to solicit their input on impacts and mitigation measures	Descriptions of the project would be discussed with key government representatives to solicit their input into the process of dealing with environmental impacts
1.5		**Invest. means to mitigate increased water levels, including estimated costs**	
		Note : This task to be undertaken by Man. Conserv., based on	
		information provided by KGS Group	
1.6		**Consider modifications to Ste. Agathe Detention Concept**	
	1.6.1	Means to release excess floods up and exceeding PMF	
	1.6.2	Elimination of backwater effects at floods less than 1 in 100 year	
		Subtotals	

Number		Work Item	Comments
2		***Winnipeg Floodway Expansion Project***	
2.1		**Invest. river regime downstream of Floodway Outlet**	This task will investigate both open water and conditions of potential ice jams to determine the appropriate water level at the Floodway Outlet to be used for design considerations, both in the Floodway expansion, and in the City of Wpg.
	2.1.1	Review aerial photos/topo maps to identify overbank flow zones and areas vulnerable to ice jams	
	2.1.2	Undertake limited surveys of river banks or potential overflow zones along the river as required to supplement existing information where necessary for resolution of the backwater issue	
	2.1.3	Undertake open water backwater analyses with existing bathymetric and topographic information for lower Red River (1826 flood up to 1:1000 year flood)	
	2.1.4	Assemble and review records of historical ice jam occurrences	Existing documented evidence as well as anecdotal evidence will be solicited from government agencies and local sources to be identified in the course of the search
	2.1.5	Estimate potential volume of fragmented ice inflow that could be reasonably expected to accumulate in an ice jam	This information will be based on evidence that may be identified for the red River, and from other similar rivers
	2.1.6	Undertake ice jam simulations with existing proven software to estimate reasonable upper limit of potential ice jam effects on water levels	
	2.1.7	Estimate river stage/discharge curves at the Floodway Outlet that have varying degrees of probability of being exceeded	This task will combine the hydraulic conditions of the river for open water conditions and the probabilistic effects from ice jam formation
	2.1.8	Estimation of backwater profiles from Floodway Outlet upstream through Winnipeg	Based on standard step backwater analyses with existing river bathymetric data
	2.1.9	Allowance for additional investigations as required that will result from evidence prepared	This contingency will be available to cover unforeseen tasks that may arise as the investigation of the lower Red river evolves
2.2		**Identify socio-economic issues for the project**	
	2.2.1	Understand project (transfer of knowledge to socio-economists)	
	2.2.2	Define study area and affected groups	
	2.2.3	Socio-economic characterization	Determine under what baseline socio-economic conditions the projects will be assessed. Sources could include key person interviews, case studies, and comments received during Commission meetings with the public.
	2.2.4	Identify socio-economic issues and how projects compare on these issues	Using the characteristics identified in 1.1.3 and 2.2.3, this task would develop a list of issues and means of comparing alternatives against these issues.
	2.2.5	Estimate benefits/disbenefits of using Floodway to minimize water level fluctuations in Wpg during summer months	This would include consideration of conditions in Wpg and the impacts of raising water levels upstream of the floodway to mitigate fluctuations of water level in Wpg
		Subtotal	

Number		Work Item	Comments
2(Cont'd)		*Winnipeg Floodway Expansion Project*	
2.3		**Invest. all identified environ. impacts and means to mitigate**	
	2.3.1	Review previous studies by KGS Group	Main issues have been identified and described in KGS Group Report to IJC Task Force
	2.3.2	Confirm/identify environmental impacts of project	This would include review and consideration of all aquatic, terrestrial, and air quality impacts both during construction and in the long term.
	2.3.3	Identify means to mitigate impacts	This would entail working with the engineering staff to identify and develop schemes to mitigate as much as possible the potential impacts.
	2.3.4	Liaise with government agencies to solicit their input on impacts and mitigation measures	Descriptions of the project would be discussed with key government representatives to solicit their input into the process of dealing with environmental impacts
2.4		**Resolve mode of operation of expanded Floodway**	
	2.4.1	Estimate benefits/disbenefits of water levels above/below the "state of nature" at the Floodway Inlet	This task will take advantage of GIS models of damage potential developed previously by KGS Group
	2.4.2	Consider feasibility of modifying expanded Floodway design to avoid exceeding "state of nature" water level at Floodway Inlet	
2.5		**Preliminary Design of Floodway Expansion**	
	2.5.1	Select design flow based on results of analysis of lower Red River, backwater effects in Wpg, and review of Floodway expansion economics	
	2.5.2	Assemble backwater profiles in Winnipeg for selected design condition of Floodway	
	2.5.3	Address requirements (and costs) for raising Primary Dikes in Winnipeg to suit Floodway design condition	
	2.5.4	Address requirements (and costs) for improving internal flood protection system within Wpg to suit design condition for Floodway	
	2.5.5	Assess appropriate treatment of bridge decks to minimize risk of failure when decks are submersed (applies to expansion schemes that do not require replacement or substantial modification of existing bridges)	
	2.5.6	Optimize design of Floodway expansion, including all bridges, structures, and the channel geometry, to minimize costs and environmental impacts	
	2.5.7	Develop alternative design of Floodway expansion to provide "wet Floodway" in summer months	
	2.5.8	Assess economic justification of adopting a "wet Floodway" concept, considering recreational benefits identified in Task 2.2	
	2.5.9	Refine selected expansion scheme (either conventional Floodway or "wet Floodway")	
	2.5.10	Develop requirements for adjustments to local wells to suit modified Floodway design	
	2.5.11	Prepare preliminary design drawings to demonstrate the proposed modifications required to the Floodway channel, structures and "crossings" (approximately 15 drawings are envisaged and budgetted)	
		Subtotal	

Number		Work Item	Comments
2(Cont'd)		***Winnipeg Floodway Expansion Project***	
2.6		**Develop design criteria for all structures/channel**	
2.7		**Refine strategy of modifying "crossings"**	
	2.7.1	Provide proposed channel modifications to individual Owners of "crossings"	
	2.7.1	Review possible channel modifications with Owners	
	2.7.1	Evaluate input from Owners	
	2.7.1	Refine selected strategy and confirm costs	
2.8		**Develop construction schedule**	
2.9		**Cost estimation for all components of project**	
	2.9.1	Excavation	
	2.9.2	Outlet structure	
	2.9.3	Crossings	
	2.9.4	Environmental mitigation requirements	
	2.9.5	Engineering	
	2.9.6	Interest during construction	
	2.9.7	Estimate construction cost contingency appropriate for the level of definition of the project	This would include approximate risk analysis of main cost components, and preparation of a "range estimate"
2.10		**Develop strategy for contracting for optimum execution of project**	
	2.10.1	Consult with excavation contractors regarding current/future capabilities	
	2.10.2	Review strategy used in original excavation of existing Floodway	This would involve interviews with engineers familiar with that project in the 1960's, and review of historical documents available through Man. Conserv.
	2.10.3	Develop proposed strategy for proposed expansion scheme	
		Subtotal	0

Work Plan

Number	Work Item	Comments
3	***Common Items for Overall Study***	
3.1	**Preparation for Public Participation Program**	
1.1.1	Preparation of information on Projects (both Floodway and Ste Agathe Detention Concept)	This task requires the assembly of detailed information from previous work.
1.1.2	Attendance as required at meetings with key persons of Public (covers both Projects)	This is undefined at this time, but is an allowance for probable small-scale meetings with selected stakeholders, probably late in the study period, and prior to commencement of the public participation program
1.1.3	Public Participation Program Planning / Development	This task would include identification of possible approaches to public participation, examination of alternatives, consensus on appropriate approach, and preparation of an implementation plan
3.2	**Disbursements**	
3.3	**Progress Meetings with Coordinating Committee (budget for 5)**	
3.4	**Study Management / Coordination / Progress Reporting**	
3.5	**Reports**	
3.4.1	Report in March/2001	
3.4.2	Report in July/2001	
3.6	**Secretarial Support Services (1200 hrs @ $30/h)**	
3.6	**Special Consultants (Bert Lukey)**	
	Subtotal	

Grand Total of All Hours and Costs
(Summation of figures from Sheets 2 to 6)

APPENDIX B

LIST OF PROPOSED MEASURES FOR IMPROVEMENT OF FLOOD PROTECTION INFRASTRUCTURE IN CITY OF WINNIPEG

City of Winnipeg Flood Risk Assessment

Improvements to Flood Protection Infrastructure Within City of Winnipeg

Descriptions and Estimated Costs (Millions $)

Item	Project	Flood Protection Category				Notes
		Prudent to do	Benefits Primarily High River Level Protection		Benefits Primarily Internal Drainage	
			To James Ave 23.0 ft	James Ave. 23.0 ft to James Ave. 25.8 ft		
1	Flood Activity/Emergency Manual	$2.00				Underway by COW
2	Flood Pumping Station Reliability Upgrades		$1.00	$7.00	$1.00	Recommended by KGS (1995)
3	Land Drainage Sewers Outfall Gate Structures		$8.50	$11.00	$5.00	Land drainage outfalls were considered to benefit primarilly high level protection. Storage availability also benefits internal drainage.
4	Floodplain Management					Floodplain management costs are outside primary dikes and not considered applicable for this study.
5	Permanent Secondary Dikes					To be addressed by the Secondary Dike Study (excluded from this study)
6	Sump Pump and Backwater Valve Flood Proofing Incentive				$50.00	
7	Sewer Manhole Extraneous Flow Reduction, and Misc. Culvert Mitigation		$1.00	$1.00		
8	Background and Technical Data	$1.70				
9	Location of Sewer Cross-connections	$2.00				
10	Permanent Land Drainage Pumping Stations				$16.80	
11	Pollution Control Centre Upgrades		$5.20			
12	Sewer System Isolation in Areas Protected by Secondary Dikes		$2.20	$3.80		
13	SEWPCC Catchment Area Infiltration/Inflow Study	$0.75				
14	Wastewater and Land Drainage Systems SCADA	$10.00				
15	Combined/Separate Sewer Systems Studies Model	$8.00				

Item	Project	Flood Protection Category				Notes
		Prudent to do	Benefits Primarily High River Level Protection		Benefits Primarily Internal Drainage	
			To James Ave 23.0 ft	James Ave. 23.0 ft to James Ave. 25.8 ft		
16	Combined Sewer Flood Pumping Station/System Capacity Upgrades				$41.90	Upgrades to existing capacity were not recommended (KGS, 1995) on the basis of an economic analysis. New pump stations to be evaluated.
17	Supply of Miscellaneous Food Fighting Equipment & Hardware		$0.50	$1.00	$1.50	
18	Kingston Crescent Sewer System Isolation		$0.90			
19	Flood Proofing of Civic Buildings				$0.17	
20	Flood Proofing of Winnipeg Hydro Facilities & Equipment				$2.60	
21	Street Upgrading					Streets item outside primary dikes and this should be considered with the secondary dike study.
22	Riverbank Stabilization Study	$0.20				
23	Riverbank Stabilization - Public Property		$7.00			Riverbank issues should be reviewed on a case by case basis. Recommended where it affects primary dike or critical flood infrastructure (ie. Flood Pump Station).
24	Primary Dike System Upgrade			$23.80		
25	Existing Structures Upgrade to Accommodate Temporary Pumping				$2.00	
	Subtotals	**$24.65**	**$26.30**	**$47.60**	**$120.97**	
	Total	**$219.52**				

Costs shown in Millions of 1999 Dollars